Winter 12-10-2002

Global Geo-Demographic Data and GIS for E-Business

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Abstract

The results of a comprehensive survey of the availability and characteristics of digital geo-demographic data in 40 countries around the world are presented.

Geographic information systems (GIS) often used in conjunction with the Internet are being used by technologically savvy companies to perform marketing studies and provide location specific data such as maps to clients and customers. However, the national level Availability and characteristics of the required digital geo-spatial data vary considerably from nation to nation. Every country's data differs in terms of existence, cost, accuracy, precision, format, content, and availability over the Internet. Some countries (such as Switzerland and the United Kingdom) have current data on every hectare and house along with demographics for every group of 100 residents available for interactive web-based mapping and analysis. Other nations have such data in only non-digital forms and then only internally. Most nations are intermediate in terms of the use of characteristics and availability of geospatial data relevant for E-business.

Presented here are the results, especially those pertaining to E-business, of an e-mail survey of the national census and national mapping authorities of 40 selected countries. These the G7, Russia, China (PRC, Taiwan and Hong Kong), India, Australia, many European countries, along with 4 other Asian, 4 Latin American, 2 Middle Eastern and 2 African nations. Also presented is statistical analysis of the responses and information from follow-up questions.

1. Background

A survey of the National Census authorities and National Cartographic Authorities of 40 developed and developing countries was conducted starting in January 2002. The purpose of the survey was to gauge the character and availability of geodemographic data and infrastructure data (principally streets and building locations and footprints) in a GIS format for use in marketing, location studies and similar applications. The surveys consisted of 23 and 24 questions respectively questions initially emailed to the national census authority and national mapping, cartographic cadastral or land planning authority of the country the authorities were identified using a web page maintained by the U.S. Census Bureau and a web page maintained by the U.S. Geological Survey and containing contact information for 120 census bureaus and mapping authorities. Follow-up by email, fax and in several cases phone call elicited further information. As of Mid June 2002, 19 of the 40 countries had responded, to one or the other survey instrument or replied to the email with the results presented and analyzed below.

2. Choice of Countries

The criteria for selection of the countries were primarily the likelihood based on prior knowledge or development level that GIS. Thus the USA, Canada, Australia, Great New Zealand, Britain, the Netherlands, Sweden, Finland, Switzerland, Singapore were selected. Also economic importance in the global economy was a factor thus Japan, France, Italy, Spain, Germany, India, Russia, China were selected although the level of technological development was significant for most of these countries as well. In an attempt to get a good geographic distribution of countries, Israel (middle east), South Africa (Africa) Chile, Argentina, Brazil, and Mexico (Latin America), Eastern Europe (Czech Republic, Poland, Hungary) Asia (Taiwan, South Korea) were selected. Australia and New Zealand also helped to represent every populated continent. Review of web sites led to the inclusion of Malaysia and Egypt to the list. In addition Belgium, Luxembourg, Denmark, Austria, Ireland and Portugal. The decision to only survey 40 countries was arbitrary and exclusion of such countries as Greece is probably more of an over sight than a deliberated decision. Exclusion of Sierra Leone (last on the U.N. Development Index) and a host of "fourth world" countries reflects the low likelihood that these nations use GIS in their census or mapping activities.

3. Contacting the Respondents

Most census bureaus had web sites which were visited. Most national mapping authorities likewise had web sites. Using either contact information on the web or information obtained via enquiries to the sites web master emails were sent to representatives of each authority. As of June 2002, 19 of the forty census authorities had responded. Also responses from 12 Mapping authorities were obtained. Follow up faxes were sent to the

authorities. This elicited several additional responses. In addition to those countries that responded by completing and returning the survey three countries responded but did not complete the survey. The Czech Republic stated they would respond but did not, the French stated (in French) they would only respond to a survey in French and the Mexicans indicated in Spanish that they had information on a web site about their use of GIS. Singapore responded to the email by stating they do not use GIS in their census activities and to the fax by faxing back a polite refusal to respond to the questionnaire. The countries that responded before June 2002 included. Australia, Belgium, Brazil, Canada, Finland, Hong Kong, Iceland, Israel, Italy, Germany, New Zealand, Norway, Singapore, South Africa, Sweden, Switzerland, Taiwan, the USA and the United Kingdom. Japan, Denmark, Holland and Portugal were all contacted indirectly and their use of GIS was determined, but no official response was made prior to mid-June 2002. Thus 19 countries responded completely, three additional countries responded by stating they would reply soon, but did not follow through nor respond to faxed enquiries. Thus an initial 50 % response rate was achieved. A Spanish, French and Chinese language version of the survey was prepared but no responses to these versions of the survey dispatch in May of 2002 were received prior to the preparation of this paper.

The surveys of mapping authorities involved more difficulties than the survey of Census authorities. This is largely because although all developed nations use GIS for national mapping, the mapping function resides in many agencies with many names in different countries. Thus in England one has an ordnance survey in the U.S one has a Geologic Survey with a cartographic division, in Canada mapping is in the department of natural resources, in Norway a national Cartwerk (Cartographic Workshop), In Switzerland a National Cadastral agency, In Holland a spatial planning agency, in Portugal a National GIS, In Spain an Institute for Geography, In Japan a national geographic Survey, etc, etc. In Chile and Italy mapping is a function of the military but in Chile it is an institute of military geography while in Italy the navy maps the costal areas, the army the interior and the air force aerial navigation charts are a responsibility. Therefore just identifying which agency has responsibility. In fact their can be overlapping responsibilities. Thus the topographic maps in Germany are prepared by one agency ant the national level while the cadastral maps are state by state as is aerial photography and land-use mapping. Since in all the agencies GIS is widely used figuring out exactly who to have responded has been a problem. Nevertheless as of mid-June 2002.12 agencies have responded.

A sample of the cover letter is presented in figure I below.

DEPARTMENT OF
GEOGRAPHY AND GEOLOGY
Huntsville, Texas 77341-2148

SAM HOUSTON STATE UNIVERSITY 1879

Telephone (936) 294-1451
FAX (936) 294-3940

Dear National Census Authority representative…the following are instructions for completion and return of the accompanying survey of GIS use in your organization.

INSTRUCTIONS:

This is a survey of GIS use in Census Authorities around the world. Agencies in your country and in 39 other advanced countries are being contacted. The following page contains a survey of geographic information system (GIS) use in developing products such as maps used by your agency. It is being used to gather information that potential customers and other users of your agencies data would appreciate having. The results of this survey will be presented at the world's foremost international GIS conference. They will not be used for commercial purposes. Please answer every question to the best of your ability. Place a check mark in the appropriate box for the (YES_X__, NO___) format questions. If you are unsure about the nature of the question or need clarification about what is an appropriate response, do not hesitate to contact me. Your personal information name phone number etc. will not be divulged and are request solely so I can contact you to clarify any questions I have about your response to this survey. Please respond within one month of receiving this instrument. I will make an effort to follow up with the recipient of each and every survey instrument sent out within two weeks of the time this survey is dispatched.

♦ Can you provide examples of Businesses, consulting firms or research institutes in your country using GIS? If so please send that information to Dr. Leipnik at the address below.

♦ Can you provide a sample of the GIS products your agency generates? If you can provide samples of such data please send them via airmail or email to Dr. Leipnik at the address below.

♦ Can you provide publications or references to publications describing your available cartographic products (maps and/or GIS data? If so please send the title of such publications and information on how it can be obtained to me at the address below.

You have my special thanks for participating in this survey, which will help users of GIS around the world!

Sincerely

Dr. Mark R. Leipnik, Associate Professor.
Department of Geography & Geology,
Sam Houston State University
P.O. Box 2148.
Huntsville, Texas 77341.
Phone (936) 294-3698
Fax (936) 294-3940
Email: geo_mrl@shsu.edu
(that is geo underscore mrl)

4. Questions on the Census Survey

The questions on the survey include queries intended to obtain contact information (items 1 and 2). A question about how often the national census is conducted (item # 3) which is designed to gauge the currency of data. A question about the smallest geographic units data is collected for (#4) which is designed to gauge the spatial precession of data. A question about privacy restrictions (#5) designed to determine to what extent individual responses are masked by aggregation. A question (#6) about use of postal addressing systems to track respondents which gives insights into integration of census enumeration with postal addressing something useful to marketers who have address lists of customers. A question (#7) about collection of income data and at what level of geographic subdivision this data is collected. This question provides perhaps the most important demographic information to marketers besides the actual presence of respondents. A question (#8) about occupational employment and at what geographic subdivision this data is collected which is useful to marketers and is not asked by all censuses of population. A question (#9) about educational attainment. This is a key determinant of future income and development and thus of great interest to marketers. A question (#10) about residential living arrangements and at what level this data is collected and aggregated. This is a key determinant of wealth and demand for a wide range of consumer products. A question (#11) about business location and activity this is an item frequently missing from census of population but is of great interest to companies doing location studies since it helps identify competitor's locations. A question (#12) about the level of interest expressed in obtaining census data for use in geodemographic studies. This question gauges the level of use of this data in geodemographic marketing and location studies. If little use is being made of the data a low number on a scale of 1 to 10 would be reported. A question (#13)about whether the agency uses GIS, this is a key question since if GIS is not used then by the agency then GIS data sets for the country will require a major effort by outside parties to develop. If the answer to this question is no then the respondents skip to number 23, a question (#14) about the number of years the agency has used GIS. A question (#15) on how useful on a scale of 1-10 GOS has been for the agency. A question (#16) about what features are portrayed on the base maps used in the GIS. This is designed to determine if building footprints are present, if only enumeration district boundaries are present, if roads are present etc. This is key to many other uses of the data. Question (#17) concerns the public availability of GIS data related to census activities. Since GIS may be used in an organization but the data may not be publicly available. Question (#18) concerns how long data has been publicly available. Question (#19) concerns what language the data is available in. Question #20 concerns the cost of the data. The question specified cost for nationwide coverage but most agencies specified cost for a smaller area. Question #21 concerned available over the internet and the URL of the website where the data resided. Question #22 concerned use of GPS technology by the agency. This was to see if the base maps are being built by this approach. Question #23 concerned plans for future use of GIS at the agency as was relevant for those not yet using the technology.

A sample of the survey instrument is reproduced in figure II below.

Survey of GIS use and availability of national demographic data for inclusion in a GIS.

1) Country Name:_____
Date:_____
2) Official Title of Agency:
_____
Mailing Address
_____
Name and Title of person completing survey:
_____
Email: _____
Phone: _____
Fax: _____
3) At what time interval is a national census of population conducted?_____**.**
4) What is the smallest geographic subdivision for which data is collected?_____**.**
5) What privacy restrictions exist?
_____**.**
6) Is census information collected using a postal addressing system to track respondents locations? **YES____ NO____.**
7) Is income data available for individuals in your country? **YES___ NO___.** At what level of geographic subdivision is the data available?
_____**.**
8) Is employment data available?
YES___ NO___. At what level of geographic subdivision is the data available?
_____**.**
9) Is educational attainment data available?
YES___ NO____. At what level of geographic subdivision is the data available?
_____**.**
10) Is residential living information data available?
YES___ NO____. At what level of geographic subdivision is the data available?
_____**.**
11) Is business location and characteristics data available?
YES___ NO___. At what level of geographic subdivision is the data available?
_____**.**
12) On a **scale of 1-10** where **1** represents "**no interest**", **5** represents "**moderate interest**", and **10** represents **"very active interest"**, how much interest has been expressed by businesses in your country for using and obtaining geo-demographic data? _____**.**

13) Does your agency use GIS?
YES____ NO____. (If NO… go to # 23).
14) For how many years has your agency employed GIS in the census process? **_____Years.**

15) On a scale of 1-10; where **1** represents "**counter-productive**", **5** represents "**moderately useful**" and **10** represents "**extremely useful**". How useful has GIS been in the process of enumerating and characterizing the population of your country?
_____.
16) What features (streets, building locations, etc) are present on the base-map you also use to portray census results on?**_____.**
17) Is the census data publicly available in a GIS?
YES___ NO___. (*If NO… go to # 22).*
18) For how many years has census data in a GIS format been public ally available?**_____.**
19) What language(s) are the data available in?
_____.
20) What is the cost (in local currency) of nationwide GIS format census data?**_____.**
21) Is the data available over the Internet?
YES__ NO__, URL:_____.
22) Does your agency use global positioning systems for systematic mapping?
YES___ NO___.
23) Does your agency plan to use GIS in the future?
YES___ NO____. At what date?**_____.**

Thank you for your assistance…You may return this survey via fax to (01) 936-294-3940, via email to geo_mrl@shsu.edu that is geo "underscore" mrl @ shsu.edu or by mail to Dr. Mark Leipnik, Department of Geography SHSU, P.O. Box 2148, Huntsville, Texas 77341.

5. Questions on the Survey of Mapping Authorities

The initial three questions on each survey were contact information related questions and were the same as on the census survey. Question #4 related to the scale of topographic maps and was designed to determine the precision of available data for inclusion in a GIS. #5 concerned the features portrayed. If buildings are portrayed this is significant for business applications. Question #6 regarded the intervals that maps are prepared. In the U.S. for example remapping in non-systematic with the average age of topographic maps being 28 years and the oldest map that is still the official "current" topographic being 67 years old. Question #7 dealt with the system of geographic subdivision in use. Question #8 regarded tracking residences, it is important since to geo-code customer information one needs this data or street address ranges. Question #9 concerns if business locations are mapped. Question #10 regards a postal addressing system. Question #11 asks if GIS is used. Question #12 asks for how many years has it been in use. Question #13 asked how useful the system is internally. Question # 14 regards tracking street addresses. Without such street address ranges or building footprints geo-coding customer locations can only be done to a region. Question #15 regards the public availability of GIS data. Question number #16 formats the GIS data is available in. Question # 17 involves the cost of the national level data. Question #18 regards the languages the data is available in. Question #19 involves availability of data on the Internet. Question #20 involves level of interest expressed by external users in obtaining data on a scale of 1-10. Question number 21 involves use of remotely sensed imagery, question #22 involves use of digital aerial photography. Question #22 involves availability of this digital aerial photography data. Question # 24 involves future likelihood of using GIS.

6. Follow-up Questions

For all agencies responding to the survey a follow up message was sent in every case where GIS was used it enquired as to what GIS software was being employed. Also various clarifications were sought. For example if the agency such as New Zealand indicated that the smallest geographic subdivision that data was available for was a "meshblock" but did not define what this constituted a request to clarify what this was made. Also those agencies not responding to the initial email were emailed again within two weeks, and then a fax was sent to all non-responding countries. Another approach was then adopted for non-respondents with emails sent to GIS specialists in academic institutions in each country. Thus Japan, Denmark, Holland, Austria and Portugal were contacted. The Universities were University of Tokyo, Copenhagen University, University of Utrecht, Technical University of Vienna and New University of Lisbon. This produced some useful information. Specifically that GIS was not in use by the Dutch who had their last census in 1971 and use registers and for Japan were GIS is in use in the national census but at the very beginning stages and application.

With respect to choice of software ESRI products were used by all respondents with the exception of the Australian census authority which uses Map/Info products primarily.

7. Response Rate

The response rate and the time it took to respond were a very useful if indirect measure of the efficiency of the organizations and their responsiveness at least to queries made in English. The most rapid response was from Norway which Responded within 1 day. Singapore and Sweden also responded within 2 days and Germany responded within 1 week. Many countries failed to

respond within 1 month and a follow up email was sent, after two months a follow up fax was dispatched. The table below shows the response status as of mid June 2002. As an objective measure of the development level of the country the UN development program human development index rank is also displayed. The table lists responders in order of response.

Table 1.

Country	Responded	Use GIS	Response Time	Response Rank	UNDI Rank
Norway	Yes 4/16	Yes	2	1	1
New Zealand	Yes 4/16	Yes	2	1	19
Sweden	Yes 4/17	Yes	3	2	4
Australia	Yes 4/22	Yes	8	3	2
Germany	Yes 4/25	No	11	4	17
Switzerland	Yes 4/30	Yes	15	5	11
U.K.	Yes 1/5	Yes	16	6	14
Spain	Yes 5/8	Yes	19	7	21
South Africa	Yes 5/15	Yes	31	8	94
Hong Kong	Yes 5/19	Yes	35	9	24
Israel	Yes 5/20	Yes	36	10	22
Taiwan	Yes 5/21	Yes part	37	11	Not rated
USA	Yes 5/22	Yes	38	12	6
Italy	Yes 5/27	Yes	43	13	20
Belgium	Yes 5/27	Yes	43	13	5
Finland	Yes 5/28	Yes	44	14	10
Brazil	Yes 5/30	Yes	46	15	69
Singapore	Yes 5/30	No	46	15	26
Iceland	Yes 5/31	No	47	16	7
Canada	Yes 6/5	Yes	52	17	3
France	4/30 French	?			13
Czech Rep.	receipt 5/2	?			33
Mexico	5/10 Spanish	Yes			51
Netherlands	Academic Response	No			8
Japan	Academic Response	Yes			9
Luxembourg	No	?			12
Denmark	Academic	yes			15
Austria	No	?			16
Korea	No	No			27
Portugal	Academic Res	Yes			28
Argentina	No	?			34
Hungary	No	?			36
Poland	No	?			38
Chile	No	?			39
Russian Federation	No	?			55
Malaysia	No	?			56
China	No	?			87
Egypt	No	?			105
India	No	No			115

The table indicates some relationship between response time and United Nations Development Index rank although there are outliers like Canada. In all fairness, Canada responded within 10 days with a question about how many respondents were required and the system eventually produced a very thorough response. France also responded promptly, but indicated only a questionnaire in French would be acknowledged, A French translation was prepared and sent a month later but no response was received as of mid June 2002. It is also clear that except for the Germans which do not use GIS in their census efforts that those countries not using GIS are more likely not to respond or respond later. The usually efficient Dutch did not respond contact with the leading GIS center in Holland (University of Utrecht) elicited the information that the Dutch do not use GIS in the census efforts and last conducted a census in 1971. They have however accurate postal code GIS. Also those countries low on UNDI are less likely to use GIS. Non-responses from Denmark, Japan and Portugal were also surprising. Follow up with academic institutions in these countries resulted in forwarding of the survey to GIS experts in census authorities and the information that GIS is used in census efforts in all three countries, the completed surveys were not available by mid-June however.

8. Salient Points

8.1 Census Authority Survey

Several salient points can be learned from study of the responses to the questions. One is that GIS use is becoming common place among census authorities in developed countries. Another is that a few countries that have systems of registers and require registration when citizens move from one locality to another have not adopted GIS in site of technological advanced status. These nations include Singapore, Germany, Holland and Iceland. In the case of Iceland most of the population is concentrated in one City.

With respect to the census frequency, most countries have copied the U.S. method set down in the constitution of a decennial census. However, Finland conducts a census every year while New Zealand uses 5 year intervals and Sweden uses 5 years and 15 year intervals. Holland last conducted a census in 1971 and Germany last conducted a census in 1983.

As to the collection of various types of data most countries collect educational attainment and residential living data, fewer collect income data and very few collect information about business establishments. Finland asks

the most complete set of questions.

As to the geographic subdivisions that data is collected for, most countries have something equivalent to census tracts and blocks used in the U.S. typically 100 people approximately reside in these enumeration areas the use municipalities while several countries have data for individual residences such as Switzerland, Finland, Norway, U.K. and Sweden. Few countries have postal addressing links, England and Holland being exceptions.

Privacy is protected by all countries to some extent, some like aggregating the data to municipalities, mostly aggregating it to groups of 100 or more (so % data cannot be ascribed to a single individual) a few such as Sweden have 5 or more respondents. Duration of use of GIS varies greatly from a high 27 for Sweden, 25 years for the U.S. and 15 years for Canada to only 2 years for Brazil and in the developmental stages in Taiwan and Japan..

Most countries found GIS very useful and most had had significant interest in use of GIS expressed. The mode for utility was a 10, while the mode for interest was a 9.

All countries that responded released data publicly in some form, some on CD, some over the Internet. Many will sell digital data commercially.

The languages the data was available in varied. In France it is exclusively in French, In the Latin American Countries it is exclusively Spanish, except for Brazil which has data in Portuguese and English. Data in English is also available in Norway, and Germany. And Canada (French also for Canada).

Use of the Internet to disperse data was less common with the U.S., New Zealand, and Norway being leaders. Most agencies preferred to sell data with costs ranging from a low for the U.S. of approximately $300. Switzerland was notable in setting a rate of .0002 Swiss franc per hectare a unique approach made possible by the use of a 50 meter grid as to track data. The U.K. estimated that it's nationwide GIS (including both census and topography) would be sold for a modest 40 million pounds!

GPS use was very rare with only Brazil and Australia really using GPS in census activities, probably because of their sprawling size.

9. Mapping Authority Survey Responses

Scales of Maps prepared ranged from Switzerland which had GIS data for a 50 meter grid to Australia which only had data at scales of 1:100,000. The U.S. uses a scale of 1:24,000 while England uses a 1:500 scale.

Typical features portrayed on the topographic maps include political boundaries, Roads and rail lines, hydrographic, counters. Some maps portray land-use such as U.S. and German, some portray building footprints such as German, U.K. and Swiss. Some have unique features portrayed such as the fence lines on Australian maps or the individual fruit trees on Swiss maps.

Maps were updated every 1-5 years in the United Kingdom, every 5 years in New Zealand every 5-20 years in Australia and on average every 28 years in the USA.

Some countries mapped residences such as Great Britain, Norway, Germany and Switzerland

Few countries mapped business locations specifically only Britain and Switzerland.

Most countries had a national system of postal addressing in Spain, Germany, Holland, and Great Britain that system is in the GIS, It is not in a GIS in the USA.

Most countries contacted used GIS with the possible exceptions of Egypt and India (non-respondents who are largely relying on colonial era mapping).

The number of years that GIS was in use varied from more than 30 in the USA and Canada to 30 in the U.K. to 18 in Spain to 15 in Germany.

Cost of the data ranged from$1,500 for New Zealand to 40 million pounds for the U.K.

The USA, Canada and Switzerland were among the few countries with GIS data available over the Internet.

Use of remotely Sensed imagery was common although less common than use of aerial photography. However most nations did not have available digital aerial photography, Switzerland and Germany were exceptions however.

10. Respondent information

Information used to contact the National Census Authorities is summarized below.

Country Name Agency Name Web Site Contact Person E-mail Address Phone Fax

Argentina: http://www.indec.mecon.ar/Idefault.htmces@indec.gov.ar

Australia: http://www.abs.gov.au/client.services@abs.gov.au

Austria: http://www.oestat.gv.at/

Belgium: Institut national de Statistique http://www.statbel.fgov.be/ Pierre Jamagnedesk@statbel.mineco.fgov.be"44 rue de Louvain, 1000 Bruxelles, Belgium" 00 32 2 5486597 00 32 2 5486626 5/27/2002

Brazil: Fundacao Instituto Brasileiro de Geografia e Estatistica http://www.ibge.gov.br/english/default.phpibge@ibge.gov.br Rua General Canabarro 706 - 2 andar 0055 (021)5692043 0055 (021) 2348480 4/30/2002

Canada: Statistics Canada statcan.ca/English Robert Parenteau Robert.Parenteau@stat.can "Tunney's Pasture, Jean TaLor Bldg, 120 Parkdale, Ottawa, Onterio"613-951-2958 613-951-0569 "April, 2002" 6/4/2002

Chile: http://www.ine.cl/ Spanish

China (PRC): http://www.stats.gov.cn/english/index.htmceco@mx.cei.gov.cn

Czech Republic: http://www.czso.cz/eng/angl.htm Tomál Bládek MLADEK@gw.czso.cz 3/22/2002

Denmark: Statistics Denmark http://www.dst.dk/dst/dstframeset_1024_en.asp michael.deggau@destatis.de 4/16/2002

Egypt: http://www.czso.cz/eng/angl.htm gisc@capmas.gov.eg

Finland: Statistics Findland http://www.stat.fi/index_en.html Ulla-Maarit SaarinenUlla-Maarit.Saarinen@stat.fiFIN-00022 STATISTICS FINLAND 358 9 17 341 358 9 1734 32515/28/2002

France: http://www.insee.fr/en/home/home_page.asprenseignements@insee.fr 3/13/2002 French

Germany http://www.destatis.de/e_home.htm Michael Deggau michael.deggau@destatis.de 4/14/2002

Hong KongCensus and Statistics Departmenthttp://www.info.gov.hk/censtatd/ SO Shui-sing cp2_1@censtatd.gov.hk "7/F, Kai Tak Multi-storey Carpark Building, 2, Concorde Road, Kowloon, Hong Kong" 852-27168008 852-27160231 4/19/2002

Hungary: http://www.ksh.hu/pls/ksh/docs/index_eng.htmlbelane.takacs@ksh.gov.hu

Iceland: Statistics Iceland http://www.statice.is/ Magnus S. Magnusson Magnus.Magnusson@hagstofa.is"Statistics Iceland, IS-150 Reykjavik, Iceland" 354-560 9836 354-562 8865 5/31/2002

India: http://www.nic.in/stat/ webmaster@www.nic.in

Israel: Israeli Central Bureau of Statisticshttp://www.cbs.gov.il/engindex.htm Shahar Katz shahar@cbs.gov.il 4/10/2002 5/20/2002

Italy: ISTAT - National Institute of Statisticshttp://www.istat.it/homeing.html http://www.istat.it http://www.geodati.com Fabio Crescenzicrescenz@istat.it Via A. Rava 150 00142 Roma Italy:39065414980 39065943011 5/27/2002

Japan: http://www.stat.go.jp/english/index.htmtokyo.iaos@stat.go.jp

Korea: http://www.nso.go.kr/eng/"webmaster@nso.go.kr webmastre@nsohp.nso.go.kr"

Luxembourg: http://statec.gouvernement.lu/ French

Malaysia: http://www.statistics.gov.my/

Mexico: http://www.inegi.gob.mx/difusion/ingles/portadai.html

Netherlands: http://www.cbs.nl/en infoservice@cbs.nl

New Zealand: Statistics New Zealnad http://www.stats.govt.nz/ Zane Colvillezane_colville@stats.govt.nz "Private Bag 4741, Christchurch 8001, New Zealand"64-3-374-8756 64-3-374-8723 5/16/2002

Norway: Statistics Norway www.ssb.no Mr. Lars Rogstad Lars.rogstad@ssb.no 4/13/2002 4/16/2002

Poland: http://www.stat.gov.pl/english/index.htmbiwsek@stat.gov.pl

Portugal: http://www.ine.pt/index_eng.htmdre@mail.telepac.pt

Russia: http://www.gks.ru/eng/stat@gks.ru

Singapore Singapore Department of Statisticssingstat.gov.sg
Ms. Yap Lay Hooninfo@singstat.gov.sg "100 High Street #05-01, The Treasury, Singapore 179434" 65-6332 7754 65-6332 7174 3/13/2002

South Africa http://www.statssa.gov.za/

Spain: http://www.ine.es/

Sweden: "Statistics Sweden Statistiska centralbyran" www.scb.se/eng/BoJustussonbo.Justusson@scb.se "Box 24300,S-104 51 Stockholm, Sweden" 4/14/2002 4/17/2002

Switzerland Swiss Statistical Office http://www.statistik.admin.ch/eindex.htm Stefan Winter Stefan.Winter@bfs.admin.ch"OFS, Place de l'Europe 10, 2010 Neuchatel, Switzerland" 41 32 713 62 57 41 32 713 65 60 4/13/2002 4/25/2002

Taiwan: Census Bureau http://www.dgbasey.gov.tw/english/dgbas_e0.htmKuo-Hua Luo robert@emc.dgbas.gov.tw "2, KwangChow Street, Taipei City, Taiwan, R.O.C"886-2-29187176 886-2-23751747 5/21/2002

United Kindom: Office of National Statistics (Geography) http://www.statistics.gov.uk/ Hayley Butcher Hayley.Butcher@ons.gov.uk"Segensworth Road, Fareham, Hampshire, P015 5RR, England" 44 (0)1329 813581 4/12/2002 5/1/2002

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11. Conclusions

GIS use in becoming widespread in the Census authorities of the World. It is even more common in the national mapping authorities, although the specific organization responsible for national mapping varies. The countries surveyed as to use of the technology by the census authority can be divided unto those which are integrating geodemographic data into national multi-purpose cadastres these include the Swiss, Swedes, Norwegians and British, Those that follow the U.S. model of a separate census based GIs with street centerlines and census enumeration districts but not features like building foot-prints or actual residential locations geo-coded these include Canada, Australia, New Zealand, Israel, Belgium, Finland, Brazil. Then there are the countries with detailed registers of population that enable they to track their residents on a essentially continuous basis and where maps are not in use these include Germany and Holland and Singapore. Lastly there are countries that are not at the level of technological sophistication to use GIS in governmental activities like census taking . Since most countries surveyed were in the top 20% of nations in terms of development this was not a common problem however

for Egypt, India and China it is.6.Also this may explain lack of response from eastern Europe and Russia and Latin America except for Brazil. Missing data from France and Latin America reflect communication difficulties or national chauvinism and possibly developmental lags in Mexico and recent poverty in Argentina. Over all, the results show a growing body of geodemographic data and spatial infrastructure data that can be used in marketing studies and locational applications as well as by social scientists and urban planners. As countries increasingly adopt the technology and standardize the content, this source of data will become a mainstay of GIS analysis throughout the world in the coming century.

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